

**COURSE OUTLINE IDES 2600A • HUMAN FACTORS/ERGONOMICS IN DESIGN • Winter  
(2023)**

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**Course Time and Location:** Please refer to Carleton Central under Student Services – Registration or Search Schedule: [https://central.carleton.ca/prod/bwysched.p\\_select\\_term?wsea\\_code=EXT](https://central.carleton.ca/prod/bwysched.p_select_term?wsea_code=EXT)

**Course Description**

Foundation course in human factors/ergonomics providing an overview of physical and cognitive considerations in product design and related design fields. Anthropometrics, biomechanical considerations, cognition, social interaction, and emotional interaction are introduced in relation to supporting user experience, health and safety, performance and productivity. Includes: Experiential Learning Activity.

Prerequisite(s): PSYC 1001 and PSYC 1002, or PSYC 1000.

Lectures and discussion three hours a week.

**Learning Outcomes**

By the end of this course, students will be able to:

1. Identify and apply HF/E principles and methods to better understand issues affecting people and systems to inform potential design interventions to improve quality of life.
2. Apply relevant principles and information on anthropometrics and the physiological limitations/capabilities of people to identify issues and opportunities affecting user experience, health, safety, performance, and/or productivity.
3. Apply relevant knowledge of cognitive, social, and/or emotional factors in design to improve people's experience, health, safety, performance, and/or productivity.
4. Identify possible environmental influences on people's experience and design such as spatial considerations, materiality, lighting, thermal considerations, noise and vibration, and air quality.
5. Describe possible work/activity influences on design such as pace of work, stress, fatigue, and boredom.
6. Apply HF/E principles and methods to evaluate and/or design: seating, handles, manual materials handling devices or systems, digital devices or experiences, wearables, consumer electronics, work areas, residential products or areas, services, and/or systems.
7. Produce written reports, and oral and visual presentations demonstrating HF/E research, analysis, and design recommendations/proposals.
8. Collaborate with team members and take responsibility for individual contributions.
9. Demonstrate professional behaviour.

## Course Deliverables

These are the deliverables for this course. Please see 'Appendix A Course Schedule' for more detailed information.

**Grading:** The final grade for the course will be based on:

1. Quizzes & Exercises	10%	Due dates assigned in class.
2. Assignment 01	20%	Due February 10, 2023, 11:55PM.
3. Assignment 02	30%	Due March 17, 2023, 11:55PM.
4. Assignment 03	35%	Due April 27, 2023, 11:55PM (take-home exam).
5. Participation	5%	NA.

## Student Access to Quiz, Test and Exam Papers

Examinations are for evaluation purposes only and will not be returned to the student.

## Required Materials

Materials required for the course are listed below. You may be asked by your instructor to refer to Brightspace for a more comprehensive list of required materials.

1. Measuring devices.
2. Camera.
3. Drawing and model making supplies.

## Required Reading:

Both textbooks below are required and are available at the Carleton Bookstore. There are also hardcopies of each book on reserve at the Carleton Library and E-books available (for more information see Library Reserves - View course in Ares on Brightspace). Required journal articles available in Ares on Brightspace.

- Pheasant, S. & Haslegrave, C.M., (2018). *Bodyspace: Anthropometry, Ergonomics and the Design of Work*, 3rd Edition. CRC Press, Taylor & Francis Group, Boca Raton FL.
- Preece, J., Sharp, H. & Rogers, Y. (2019). *Interaction Design: Beyond Human-Computer Interaction*, 5th Edition. John Wiley & Sons Ltd., West Sussex, UK.

## Additional Reading:

Select chapters from the following book are recommended to be downloaded as a PDF from the E-book:

- Bridger, R.S (2018). *Introduction to Human Factors and Ergonomics, 4th Edition*. CRC Press, Taylor & Francis Group, Boca Raton FL
- Chapter 9 from Preece, J., Sharp, H. & Rogers, Y. (2011). *Interaction Design: Beyond Human-Computer Interaction*, 3rd Edition. John Wiley & Sons Ltd., West Sussex, UK.

## Computer Requirements

Please refer to the computer requirements on the School of Industrial Design Website. You may be asked by your instructor to refer to Brightspace for other information or requirements related to computer work.

<http://www.id.carleton.ca/undergraduate/about-the-bid-program/computer-requirements>

## **Individual/Group Work**

Courses may include individual and group work. It is important in collaborative work that students clearly demonstrate their individual contribution.

## **Review/Presentation Attendance**

Attendance at scheduled SID Reviews/Presentations is mandatory. These are equivalent to exams when indicated in the course outline. Failure to attend the Review/Presentation without reasonable cause, will result in a grade of F. Students arriving late for the Review/Presentation or not remaining for the complete session without approval from the instructor, will be addressed on a case-by-case basis at the discretion of the instructor.

If you are not able to attend a Review/Presentation, foresee arriving late or need to leave before it is complete, please email your instructor in advance explaining the reason for the situation. It is important that you provide a reasonable rationale for your absence, late arrival or early departure. In the event of an illness or death in the family, you will be required to sign a form verifying your claim and this form is available through the SID administration office.

## **Late Submission of Lecture & Studio Deliverables**

Students who do not hand in deliverables on time will have their earned grade reduced by 10% per day up to a maximum of 3 days.

## **Participation and Professionalism**

Active participation and professional conduct (e.g. class discussion, consultations with instructors, work ethic, etc.) are important in lecture and studio courses and may be formally evaluated by a grade.

Professionalism also includes Carleton's Policy on Academic Integrity described in more detail below with links to content which you are required to review.

## **Academic Integrity**

*Carleton's Policy on Academic Integrity* is available at: <https://carleton.ca/registrar/academic-integrity/> and covers the following topics:

*Plagiarism* (e.g. submitting work in whole or in part by someone else, failing to acknowledge sources through the use of proper citations when using another's work).

*Test and Exam Rules* (e.g. attempting to read another student's exam paper, speaking to another student even if the subject matter is irrelevant to the text, using material not authorized by the examiner).

*Other Violations* (e.g. improper access to confidential information, disruption in classroom activities, misrepresentation of facts for any academic purpose).

This policy governs the academic behavior of students. In industrial design, ideas and concepts come from a multitude of sources and may be modified and utilized in the design and development process. The student should reference such sources appropriately and it is strongly advised that you read Carleton's Policy on Academic Integrity prior to conducting any work at the University.

## **Requests for Academic Accommodation**

You may require special arrangements to meet your academic obligations during the term. For an accommodation request for any of the following topics below, refer to the link provided for more information: <https://students.carleton.ca/course-outline/>

- **Pregnancy obligation:** Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the [Student Guide to Academic Accommodation \(PDF, 2.1 MB\)](#) For accommodation regarding a formally-scheduled final exam, you must complete the Pregnancy Accommodation Form ([click here](#)).
- **Religious/Spiritual Obligation:** Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the [Student Guide to Academic Accommodation \(PDF, 2.1 MB\)](#)
- **Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the

PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the [Paul Menton Centre website](#).

- **Survivors of Sexual Violence:** As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit the [Equity and Inclusive Communities website](#).
- **Accommodations for Student Activities:** Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the [Senate Policy on Accommodation for Student Activities \(PDF, 25KB\)](#).
- **The Use of Self-Declaration Forms:** In place of a doctor's note or medical certificate, students may complete the [self-declaration form](#) available on the Registrar's Office website to request academic accommodation for missed course work including tests and assignments. Students are also encouraged to connect directly with their instructors to discuss required accommodations arising from the COVID-19 situation.

## Statement on Student Mental Health

As a university student, you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you. Here is a list that may be helpful:

**Emergency Resources (on and off campus):** <https://carleton.ca/health/emergencies-and-crisis/emergency-numbers/>

### Carleton Resources:

- Mental Health and well-being: <https://carleton.ca/wellness/>

- Health & Counselling Services: <https://carleton.ca/health/>
- Paul Menton Centre: <https://carleton.ca/pmc/>
- Academic Advising Centre (AAC): <https://carleton.ca/academicadvising/>
- Centre for Student Academic Support (CSAS): <https://carleton.ca/csas/>
- Equity & Inclusivity Communities: <https://carleton.ca/equity/>

#### **Off-Campus Resources:**

- Distress Centre of Ottawa and Region: (613) 238-3311 or TEXT: 343-306-5550, <https://www.dcottawa.on.ca/>
- Mental Health Crisis Service: (613) 722-6914, 1-866-996-0991, <http://www.crisisline.ca/>
- Empower Me: 1-844-741-6389, <https://students.carleton.ca/services/empower-me-counselling-services/>
- Good2Talk: 1-866-925-5454, <https://good2talk.ca/>
- The Walk-In Counselling Clinic: <https://walkincounselling.com>

#### **Statement on Pandemic Measures**

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are [several actions you can take](#) to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

**Feeling sick?** Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you should follow Carleton's [symptom-reporting protocols](#).

**Masks:** Masks are no longer mandatory in university buildings and facilities. However, we continue to recommend masking when indoors, particularly if physical distancing cannot be maintained. We are aware that personal preferences regarding optional mask use will vary greatly, and we ask that we all show consideration and care for each other during this transition.

**Vaccines:** While proof of vaccination is no longer required to access campus or participate in in-person Carleton activities, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible and submit their booster dose information in [cuScreen](#) as soon as possible. Please note that Carleton cannot

guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the [University's COVID-19 website](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact [covidinfo@carleton.ca](mailto:covidinfo@carleton.ca).

### **Student Responsibility**

The student is responsible for knowing the content of this course outline; the schedule of classes, assignments, and/or Reviews; and the material that was covered when absent. The studio is a professional environment and students should be working during the scheduled hours.

Unless otherwise arranged, the class will meet during scheduled class hours. Please note that attendance is important since issues and questions may be raised in class, and announcements made, along with information disseminated through Brightspace. As external professionals are often involved in our work, scheduling changes for guest lectures, presentations, and Reviews may occur at short notice, requiring students to stay informed.

### **Changes to the Course Outline**

The course outline may be subject to change in the event of extenuating circumstances.

### **Appendix A - Course Schedule**

<b>Phase</b>	<b>Unit/Date</b>	<b>Topic</b>
<b>Fundamentals</b>	Unit 01: Jan 12	<b>Introduction to:</b> Human Factors/Ergonomics (HF/E), history, & applications. <b>Readings:</b> <i>Bodyspace</i> , Chapter 01. <i>Introduction to Human Factors and Ergonomics</i> , Chapter 01.



	Unit 02: Jan 19	<p><b>Anthropometrics:</b> data, posture, normal distribution, design constraints.  <b>Introduction to:</b> the musculoskeletal system.  <b>Readings:</b>  <i>Bodyspace</i>, Chapter 02.  <i>Introduction to Human Factors and Ergonomics</i>, Chapter 02 p.31-46.  Optional: <i>Introduction to Human Factors and Ergonomics</i>, Chapter 03.</p>
	Unit 03: Jan 26	<p><b>Human variability in:</b> sex, body proportion, strength, developmental, ethnicity, social class, occupation, and ageing.  <b>Introduction to:</b> safety, foreseeable use, vulnerable populations, and safety standards.  <b>Readings:</b>  <i>Bodyspace</i>, Chapter 03.  <i>Guidance on the Application of Human Factors to Consumer Products</i>  <b>Assignment 01 given.</b></p>
<b>Application to Design</b>	Unit 04: Feb 02	<p><b>Workspace Design:</b> Clearances, reach, range of motion, postural loading, posture and strength, vision related to posture of head and neck, physical considerations in barrier-free/accessible design.  Environmental Considerations: thermal comfort, lighting, noise, and air quality.  <b>Readings:</b>  <i>Bodyspace</i>, Chapter 04.  <i>Introduction to Human Factors and Ergonomics</i>, Summaries for Chapters 09, 10, 11.</p>
	Unit 05: Feb 09	<p><b>Sitting &amp; Seating:</b> spine considerations, anthropometric principles of seat design and evaluation.  <b>Readings:</b>  <i>Bodyspace</i>, Chapter 05.  <i>Introduction to Human Factors and Ergonomics</i>, Chapter 04.  <b>Assignment 02 given.</b>  <b>Submit Assignment 01. Due Feb 10, 11: 59PM.</b></p>
	Unit 06: Feb 16	<p><b>Hands &amp; Handles:</b> handedness, strength, handle design, biomechanics, neutral posture.  <b>Reading:</b>  <i>Bodyspace</i>, Chapter 06.  <b>Group presentations of Assignment 01.</b>  <b>Product selection for Assignment 02 due.</b></p>
<b>Winter Break, No Class</b>		
<b>Cognitive Ergonomics</b>	Unit 07: Mar 02	<p><b>What is Interaction Design?</b>  <b>Introduction:</b> User Experience (UX) Design and who is involved? Conceptual Methods of Interaction, Metaphors, Interaction Types, Paradigms.  <b>Reading:</b>  <i>Interaction Design</i>, Chapters 1, 2.</p>

	Unit 08: Mar 09	<b>Basics of Cognition and Frameworks</b> <b>Reading:</b> <i>Interaction Design</i> , Chapters 3, 4.
	Unit 09: Mar 16	<b>Social Interaction &amp; Design</b> <b>Readings:</b> <i>Interaction Design</i> , Chapter 05. Optional: (to prepare for final) <i>Interaction Design</i> , Chapter 14. <b>Submit Assignment 02. Due March 17, 11:59PM.</b>
	Unit 10: Mar 23	<b>Emotional Interaction &amp; Design</b> <b>Readings:</b> <i>Interaction Design</i> (Chapter 06). Optional (to prepare for final): <i>Interaction Design</i> , Chapter 12. <b>Exam Assigned</b>
	Unit 11: Mar 30	<b>Types of Interfaces</b> <b>Reading:</b> <i>Interaction Design</i> , Chapter 07.
	Unit 12: Apr 06	<b>Interaction Design &amp; Process</b> <b>Readings:</b> <i>Interaction Design</i> , Chapter 09 (3rd Edition). You need to consult the older edition for this chapter. <b>Last Class</b>
<b>Exams</b>	Apr 13	<b>Exams</b>
	Apr 20	<b>Exams</b>
	Apr 27	<b>Submit Final Assignment. Due April 27, 11:59PM.</b>